CLAIMS

1. A method of performing incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

processing a data packet to obtain a plurality of symbol blocks for the data packet;

transmitting a first symbol block from a plurality of transmit antennas at a transmitter to a plurality of receive antennas at a receiver, wherein the first symbol block is one of the plurality of symbol blocks; and

transmitting remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted.

2. The method of claim 1, further comprising:

obtaining a selected rate for data transmission on a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas, and wherein the data packet is processed in accordance with the selected rate.

3. The method of claim 2, wherein the processing includes

encoding the data packet in accordance with a coding scheme indicated by the selected rate to obtain a coded packet,

partitioning the coded packet into a plurality of coded subpackets, and

modulating the plurality of coded subpackets in accordance with a modulation scheme indicated by the selected rate to obtain the plurality of symbol blocks.

4. The method of claim 3, wherein the coding scheme is a Turbo code, and wherein the first symbol block includes systematic bits for the data packet.

5. The method of claim 1, further comprising:

receiving a negative acknowledgment (NAK); and

transmitting a next symbol block among the remaining ones of the plurality of symbol blocks in response to receiving the NAK.

6. The method of claim 1, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), and wherein each of the plurality of symbol blocks is transmitted from a plurality of subbands of the plurality of transmit antennas, if at all.

7. The method of claim 2, wherein at least two data packets are each processed in accordance with the selected rate to obtain at least two pluralities of symbol blocks, one plurality of symbol blocks for each data packet, and wherein at least two symbol blocks for the at least two data packets are transmitted simultaneously from the plurality of transmit antennas to the plurality of receive antennas.

8. The method of claim 7, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), and wherein each of the at least two symbol blocks for the at least two data packets is transmitted diagonally across a plurality of subbands and the plurality of transmit antennas.

9. The method of claim 2, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), wherein N_P data packets are each processed in accordance with the selected rate to obtain N_P pluralities of symbol blocks, one plurality of symbol blocks for each data packet, where N_P is equal to or greater than one and is selected based on a rank of the MIMO channel, and wherein N_P symbol blocks for the N_P data packets are transmitted simultaneously diagonally across a plurality of subbands and the plurality of transmit antennas.

10. A transmitter operative to perform incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

a transmit data processor operative to process a data packet to obtain a plurality of symbol blocks for the data packet; and

a controller operative to

initiate transmission of a first symbol block from a plurality of transmit antennas at the transmitter to a plurality of receive antennas at a receiver, wherein the first symbol block is one of the plurality of symbol blocks, and

initiate transmission of remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted.

11. The transmitter of claim 10, wherein the transmit data processor is operative to

encode the data packet in accordance with a coding scheme indicated by a selected rate to obtain a coded packet,

partition the coded packet into a plurality of coded subpackets, and

modulate the plurality of coded subpackets in accordance with a modulation scheme indicated by the selected rate to obtain the plurality of symbol blocks.

12. The transmitter of claim 10, further comprising:

a transmit spatial processor operative to receive a symbol block to be transmitted and provide symbols in the symbol block to the plurality of transmit antennas.

13. An apparatus operative to perform incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

means for processing a data packet to obtain a plurality of symbol blocks for the data packet;

means for transmitting a first symbol block from a plurality of transmit antennas at a transmitter to a plurality of receive antennas at a receiver, wherein the first symbol block is one of the plurality of symbol blocks; and

means for transmitting remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly at the receiver or all of the plurality of symbol blocks are transmitted.

14. The apparatus of claim 13, wherein the means for processing includes

means for encoding the data packet in accordance with a coding scheme indicated by a selected rate to obtain a coded packet,

means for partitioning the coded packet into a plurality of coded subpackets, and

means for modulating the plurality of coded subpackets in accordance with a modulation scheme indicated by the selected rate to obtain the plurality of symbol blocks.

15. A method of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

obtaining a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet;

decoding all detected symbol blocks obtained for the data packet to provide a decoded packet;

determining whether the decoded packet is correct or in error; and

repeating the obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error.

16. The method of claim 15, further comprising:

obtaining a block of received symbols for the data symbol block; and

detecting the received symbol block to obtain the detected symbol block.

17. The method of claim 16, wherein the detecting is based on a minimum mean-square error (MMSE) detector, a maximal ratio combining (MRC) detector, or a linear zero-forcing (ZF) detector.

18. The method of claim 15, further comprising:

terminating the obtaining, decoding, and determining if the decoded packet is correct or if the plurality of data symbol blocks for the data packet have been transmitted.

19. The method of claim 15, further comprising:

sending an acknowledgment (ACK) for the data symbol block if the decoded packet is correct or a negative acknowledgment (NAK) if the decoded packet is in error.

20. The method of claim 15, further comprising:

obtaining channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and

selecting, based on the channel estimates, a rate for data transmission on the MIMO channel.

21. The method of claim 20, wherein the selecting includes

deriving a signal-to-noise-and-interference ratio (SNR) estimate for each of the plurality of transmit antennas,

determining an average spectral efficiency for the plurality of transmit antennas based on SNR estimates for the plurality of transmit antennas, and

determining the rate based on the average spectral efficiency for the plurality of transmit antennas.

22. The method of claim 20, wherein the selecting includes

deriving a signal-to-noise-and-interference ratio (SNR) estimate for each of the plurality of transmit antennas,

computing an average SNR based on SNR estimates for the plurality of transmit antennas,

determining a back-off factor, and

determining the rate based on the average SNR and the back-off factor.

23. A receiver operative to receive an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

a receive data processor operative to

obtain a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet,

decode all detected symbol blocks obtained for the data packet to provide a decoded packet, and

determine whether the decoded packet is correct or in error; and

a controller operative to, if the decoded packet is in error, direct the receive data processor to repeat obtaining a new block of detected symbols, decoding all detected symbol blocks, and determining whether the decoded packet is correct or in error.

24. The receiver of claim 23, further comprising:

a detector operative to obtain a block of received symbols for the data symbol block and to detect the received symbol block to obtain the detected symbol block.

25. The receiver of claim 23, further comprising:

a channel estimator operative to obtain channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and

a rate selector operative to select, based on the channel estimates, a rate for data transmission on the MIMO channel.

26. An apparatus for receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

means for obtaining a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet;

means for decoding all detected symbol blocks obtained for the data packet to obtain a decoded packet;

means for determining whether the decoded packet is correct or in error; and

means for repeating the obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error.

27. The apparatus of claim 26, further comprising:

means for obtaining a block of received symbols for the data symbol block; and

means for detecting the received symbol block to obtain the detected symbol block.

28. A method of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

receiving a block of received symbols for a data packet, wherein the received symbol block is for a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet;

detecting all received symbol blocks received for the data packet to obtain detected symbol blocks, one detected symbol block for each received symbol block;

decoding the detected symbol blocks for the data packet to obtain decoder feedback information;

performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration; and

generating a decoded packet based on an output from the decoding for a last iteration among the plurality of iterations.

29. The method of claim 28, further comprising:

determining whether the decoded packet is correct or in error; and

repeating the receiving, detecting, decoding, performing, and generating for another one of the plurality of data symbol blocks if the decoded packet is in error and if all of the plurality of data symbol blocks have not been transmitted.

30. The method of claim 28, further comprising:

obtaining channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas; and

selecting, based on the channel estimates, a rate for data transmission on the MIMO channel.

31. The method of claim 28, wherein the detecting is based on a minimum mean square error (MMSE) detector, a maximal ratio combining (MRC) detector, or a linear zero-forcing (ZF) detector

32. The method of claim 31, wherein the MMSE detector is used for the detecting for N iterations and the MRC detector or the ZF detector is used for the detecting after N iterations, where N is one or greater.

33. A receiver operative to receive an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

a buffer operative to receive and store a block of received symbols for a data packet, wherein the received symbol block is for a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet;

a detector operative to detect all received symbol blocks received for the data packet to obtain detected symbol blocks, one detected symbol block for each received symbol block; and

a decoder operative to decode all detected symbol blocks for the data packet to obtain decoder feedback information, and

wherein the detector and decoder are operative to perform detection and decoding for a plurality of iterations, wherein the decoder feedback information from the decoder for a current iteration is used by the detector for a subsequent iteration, and wherein a decoded packet is generated based on output from the decoder for a last iteration among the plurality of iterations.

34. The receiver of claim 33, further comprising:

a controller operative to, if the decoded packet is in error and if all of the plurality of data symbol blocks have not been transmitted, direct the buffer to receive and store another received symbol block for another one of the plurality of data symbol blocks, and to direct the detector and decoder to perform detection and decoding on all received symbol blocks received for the data packet to obtain the decoded packet.

35. An apparatus for receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

means for receiving a block of received symbols for a data packet, wherein the received symbol block is for a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet;

means for detecting all received symbol blocks received for the data packet to obtain detected symbol blocks, one detected symbol block for each received symbol block;

means for decoding all detected symbol blocks for the data packet to obtain decoder feedback information;

means for performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration; and

means for generating a decoded packet based on decoder output from the decoding for a last iteration among the plurality of iterations.

36. The apparatus of claim 35, further comprising:

means for determining whether the decoded packet is correct or in error; and

means for repeating the receiving, detecting, decoding, performing, and generating for another one of the plurality of data symbol blocks if the decoded packet is in error and all of the plurality of data symbol blocks have not been transmitted.

37. A method of receiving a data transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

detecting received symbols for a data packet to obtain detected symbols;

decoding the detected symbols to obtain decoder feedback information;

performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration, wherein the detecting is performed based on a

minimum mean square error (MMSE) detector for first N iterations, where N is one or greater, and based on a maximal ratio combining (MRC) detector or a linear zero-forcing (ZF) detector for remaining ones of the plurality of iterations; and

generating a decoded packet based on an output from the decoding for a last iteration among the plurality of iterations.

38. The method of claim 37, wherein N is equal to one.